

REMARKS

Applicant appreciates the Examiner's thorough review of the present application, and respectfully request reconsideration in light of the preceding amendments and the following remarks.

Claims 1, 4, 6, 7, 9, 10, 12, and 20 are pending in the application. Claims 1, 4, and 9 are amended. Claims 5, 8, 11, and 13-19 are cancelled. The features recited in claims 2-3 have been incorporated into claim 1, and claims 2-3 are now cancelled. New claim 20 is added to provide Applicant with the scope of protection to which he is believed entitled. The new claim finds solid support in the original specification, e.g., figure 6, figure 9, and page 7, line 6-page 10, line 15. No new matter has been introduced through the foregoing amendments.

Claims 1-3, 5-14, and 16-19 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Ahn et al. (WO 01/83101), hereinafter Ahn, in view of Pratsinis et al. (US 5,861,132), hereinafter Pratsinis. Applicant respectfully traverses this rejection for at least the following reasons.

First, claims 2-3, 5, 8, 11, 13-14, and 16-19 have been cancelled. Accordingly, the rejections of these claims are now moot.

Second, Applicant respectfully submits the Examiner has improperly combined Ahn and Pratsinis for at least the following reasons:

1) The combination of Ahn and Pratsinis, if proper, would render the device of Ahn partially inoperable for its intended purpose. The claimed invention relies on discharge electrode to generate ions, which cannot be made on the basis of the simple combination of Ahn and Pratsinis without inventive effort because of the positional and functional differences therebetween. The Examiner suggests the claimed invention can be made by interchanging the capillary of Ahn with the electrode of Pratsinis. However, Applicant submits that Ahn relies on the capillary to generate sprayed liquid droplets, without the capillary the device of Ahn would be at least partially

inoperable for its intended purpose.

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)." M.P.E.P. § 2143.02.

2) The electrodes (discharge electrode and guide duct) of the claimed invention are used to generate ions and are used for forming the particles. By contrast, the electrodes of Pratsinis are not essential for making the particles (the particles of Pratsinis can be made without the electrodes). The corona discharge electric field of Pratsinis allows for the formation of excellent quality titanium dioxide particles having high surface area and low rutile (high anatase) content, without requiring the use of the dopant materials (see column 7 line 64-column 8, line 5). In other words, the corona discharge electric field of Pratsinis renders it capable of providing particles having a high degree of purity. However, nowhere does Pratsinis disclose or suggest that particles cannot be made without the corona discharge electric field created by the electrodes. Thus, suggesting the electrodes of Pratsinis are not essential in forming particles.

For the reasons set forth above, Applicant submits that combination of Ahn and Pratsinis is improper and the rejections replied on their combination should be withdrawn.

Third, regarding amended claims 1 and 9, Applicant respectfully submits that the combination of Ahn and Pratsinis, if proper, fails to disclose or suggest wherein a direction of a corona discharge electric field is substantially **parallel** to flow of the reaction gas. The Examiner admits that Ahn fails to disclose a corona discharge electric field, and relies upon Pratsinis to remedy the deficiencies of Ahn.

The electrodes of Pratsinis are generally placed in a horizontal plane, i.e., parallel to the ground, such that the direction of the electric field is approximately **perpendicular** to the flow of the reactants (see column 8, lines 37-39). Applicant submits that Pratsinis does not disclose or

suggest wherein a direction of a corona discharge electric field is substantially parallel to flow of the reaction gas. For the reason stated above, Applicant submits that amended claims 1 and 9 are patentable over the art of record, and withdrawal of the rejection is respectfully requested.

Fourth, Applicant respectfully submits that the Examiner has mischaracterized Ahn for the following reasons:

1) Regarding amended claim 1, the Examiner alleges that in Ahn, the gas injection means 52 injects gas through throughhole 32 corresponds to the reaction control gas supplying means 50 in the claimed invention. Applicant respectfully disagrees. The gas injection means 52 of Ahn injects carrier gas for carrying the sprayed liquid droplets (see figure 1 and page 4, line 23-25), but the reaction control gas supplying means 50 of the claimed invention supplies reaction control gases such as CO₂ or N₂ in order to assist in generating a lot of ions and prevent chemical reaction from occurring by strong energy around the region where the corona is generated.

2) Regarding amended claim 9, the Examiner alleges that in Ahn, the carrier gas injection means 51 supplying carrier gas to the first guide duct 21 corresponds to the reaction control gas supplying means 50 supplying gas through the first throughhole 31 of the claimed invention. Applicant respectfully disagrees. The carrier gas injection means 51 of Ahn injects carrier gas for carrying the sprayed liquid droplets (see figure 2 and page 6, line 10~14), but the reaction control gas supplying means 50 of the claimed invention supplies reaction control gases such as CO₂ or N₂ in order to assist in generating a lot of ions and prevent chemical reaction from occurring by strong energy around the region where the corona is generated(Figure6; page 8).

3) Regarding amended claim 9, the Examiner alleges that in Ahn, the sheath gas injection means 53 supplying sheath gas through a second throughhole 33 to the second guide duct 23 (see figure 2 and page 6, line 13~15) corresponds to the reaction gas supplying device 54 supplying gas through the second throughhole 33 in the claimed invention. Applicant respectfully

disagrees. The sheath gas of Ahn prevents the heat of the flames from being transferred to the first guide duct 21, which is different from the reaction gas for generating chemical reaction, such as SiCl_4 or GeCl_4 (see figure 6 and page 8, lines 6-8), in the claimed invention.

For the reasons stated above, Applicant submits that amended claims 1 and 9 are patentable over the art of record, and withdrawal of the rejection is respectfully requested.

Fifth, regarding amended claims 1 and 9, Applicant respectfully submits that the combination of Ahn and Pratsinis, even if proper, fails to disclose or suggest a guide duct to which a first voltage is applied; and a discharging means of which a discharge electrode is positioned within said guide duct for generating ions through electric discharge, wherein a second voltage, higher than the first voltage applied to said guide duct, is applied to the discharge electrode. The Examiner admits that Ahn fails to disclose a discharge electrode, and relies upon Pratsinis to remedy the deficiencies of Ahn. Applicant respectfully disagrees.

Pratsinis discloses the electrodes are generally placed in a horizontal plane, one on each side of the flame with a gap between them where the combustion takes place (see column 8, lines 37-41). By contrast, the discharge electrode is positioned within said guide duct in the claimed invention. In other words, in claimed invention, one electrode is positioned within the other electrode. Further, the pair of electrodes of Pratsinis are generally in the form of needles (see Pratsinis, column 8, lines 28-30), whereas at least one electrode of the claimed invention is the guide duct, which is not in the form of a needle. For the reasons stated above, Applicant submits that amended claims 1 and 9 are patentable over the art of record, and withdrawal of the rejection is respectfully requested.

Claims 6-7, 10, and 12 depend, either directly or indirectly, from claim 1 or 9, include further limitations, and are patentable over Ahn and Pratsinis for at least the reasons above with respect to claim 1 or 9. Accordingly, the rejection should be withdrawn.

Claim 4 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Ahn and Pratsinis

as applied to claim 3 above, and further in view of Carnahan et al. (U.S. 5,420,424), hereinafter Carnahan.

Applicant submits that Carnahan fails to remedy the deficiencies of Ahn and Pratsinis with respect to amended claim 1. Claim 4 depends from claim 1, includes further limitations, and is patentable over Ahn, Pratsinis, and Carnahan for at least the reasons above with respect to amended claim 1. Accordingly, the rejection should be withdrawn.

Claim 15 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Ahn and Pratsinis as applied to claim 14 above, and further in view of Carnahan. In response, claim 15 has been cancelled. Accordingly, this rejection is now moot.

Regarding new claim 20, Applicant submits Ahn, Pratsinis, and Carnahan fail to disclose or suggest wherein the heating means is a heater or a flame; **when the heating means is the heater, the discharge electrode is positioned inside the guide duct; when the heating means is the flame, the discharge electrode is positioned downstream of the guide duct.** The Examiner admits that Ahn fails to disclose a discharge electrode, and relies upon Pratsinis to remedy the deficiencies of Ahn.

Pratsinis discloses that the electrodes should be placed outside the flame to minimize corrosion of the electrode tip. Preferably, the tip of the electrode is placed from about 4 to about 10 mm **outside the flame** (see Pratsinis, column 8, lines 44-47). Nowhere does Pratsinis disclose the location of the discharge electrode in relation to the guide duct. Applicant submits that Carnahan fails to remedy the deficiencies of Ahn and Pratsinis, therefore, Applicant submits claim 20 is patentable over the art of record.

Each of Examiner's rejections has been overcome/traversed. Accordingly, Applicants respectfully submit that claims 1, 4, 6, 7, 9, 10, 12, and 20 are now in condition for allowance. Early and favorable indication of allowance is courteously solicited.

The Examiner is invited to telephone the undersigned, Applicant's attorney of record, to facilitate advancement of the present application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

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Date: September 9, 2008
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